Kinetics of Terrorism

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To date, terrorism in the United States has been largely an amateur affair. The actual results, or magnitude of violence, achieved by the New World Liberation Front (NWLF) and the Weather Underground have fallen far short of their potential. Proof of this hypothesis can be seen by contrasting conventional American techniques with comparable acts perpetrated elsewhere. Specifically, a pipe bomb like those used by groups such as the NWLF requires about the same effort to construct as a car bomb assembled by the Irish Republican Army (IRA).[1] Yet the difference in the amount of destruction caused by the two devices is dramatic.

For comparison, each device can be detonated in an empty 55 gallon drum. The typical smokeless-powder-filled pipe bomb used in the United States rips a few dozen holes in the drum and perhaps splits a seam. On the other hand, the car bomb common to Northern Ireland or Guatemala which uses 150 lbs. or more of explosive leaves a sizable hole where the barrel previously stood and sends tens of dozens of metal fragments in search of unwary victims.

Certainly we have witnessed occasional massive damage in the United States. Two instances of domestic bombings on a large scale are the blast at Harvey's Casino at Lake Tahoe in 1980, and the bombing of the University of Wisconsin in 1970. In the latter instance, the explosive device consisted of slightly less than one ton of ammonium nitrate fertilizer and did significantly more than one million dollars worth of damage. Fortunately, however, these were isolated incidents. Violence on this scale occurs more commonly in Ireland, the United Kingdom, and Central America.

To date the United States has been fortunate, but what lies around the corner? We continually hear dire warnings of a resurgence of terrorist violence. While we can only speculate on the precise means which a terrorist might use, we can and should engage in an examination of our vulnerabilities and the opportunities that would be afforded to an antagonist. This objective investigation into our weaknesses requires at least a working knowledge of the mechanics of terrorist violence.

The paragraphs which follow will outline the general methodology by which premeditated acts of terrorist violence are formulated and planned. Additionally, the basic characteristics and capabilities of typical explosive devices and small arms will be reviewed, and several scenarios which illustrate the merging of the tactical opportunities with the tools of violence will be described.

Analysis and Planning

Planning violent action is not unlike the orchestration of any significant event: both begin with a statement of purpose or goal. Typically the accomplishment of more than one goal is envisioned for each action. These goals are usually tactical or strategic in nature. A tactical goal might be the kidnapping of a wealthy business executive, whereas the associated strategic goals are the media attention that will focus on the event and the financial gain that may accompany the act. Since the tactical goal must usually be met prior to the realization of the strategic goals, understanding the tactical planning process is fundamental to countering terrorist violence and thwarting the achievement of the strategic goal.

Once the terrorist's tactical goal has been established (for example, the kidnapping of an executive), a list of potential victims or targets is established and each target is evaluated. This evaluation process is termed target analysis.[2]

Target Analysis

Careful target analysis is a necessary preliminary step to consistently effective execution of the tactical goal, and begins with a period of data collection. Frequently this data collection is limited to physical observation of the target but may include the collection of photographs, maps, blueprints, and perhaps local transportation schedules. The volume of data collected is usually proportional to the value or complexity of the target. For example, for an organized attack on a facility such as the presidential retreat at Camp David to be successful, weeks would have to be spent in compiling an accurate picture of the interior layout, disposition of the security forces, and maximum time available before reenforcements arrive. A target of lesser complexity, such as the mayor of a city, may require nothing more than a few days of discreet observation to disclose numerous opportunities for successful attack.

When the available data has been collected and assembled it is subject to analysis and formulated as an operational plan. The important questions addressed during this analysis phase relate to criticality, accessibil-

ity, recuperability, vulnerability, and the extended effect that the death or destruction of this specific target will have.

Criticality is a measure of the impact on the normal flow of events caused by the death or destruction of the candidate target. If the goal is to reduce the shipment of goods from Baltimore harbor, then the blockage of the shipping lane is likely to be more critical than the destruction of a single railway. In choosing an individual as a target, the planner must assess whether the decision maker or the decision implementer is more critical to the flow of events.

What might appear to be the greatest weakness is not a liability if the opportunity to exploit it is not present. The attacker must be reasonably confident of access to the vincible point before any operational plan becomes viable. It may be determined that a candidate target is particularly susceptible to attack with a toxic agent for reasons of health, personal habits, or physical circumstances. If, however, no opportunity to introduce the toxic agent exists, then neither does the supposed vulnerability. Without accessibility, the target cannot be reasonably attacked.

The speed with which the normal flow of events would resume subsequent to a successful attack is the measure of recuperability. If, for example, the option exists to attack either a large fuel storage tank or to damage severely the turbine in a hydro-electric generating plant, the attack on the turbine has greater value in terms of recuperability due to the greater difficulty in replacing it.

When an individual is the target, his position within the hierarchy of the political or corporate structure is a reasonable indication of the difficulty that organization will have in returning to business as usual in the absence of the targeted person. This is most certainly the case in the business world, where a corporation's personality frequently mirrors that of its CEO. Removing the CEO will cause a change in any large corporation.

Vulnerability can be defined as the extent to which the target would be damaged by the destructive materials that can be brought to bear against it. Therefore, a limiting factor in the selection of a target is the availability of suitable destructive material. Specialized weapons, stable incendiary compounds and sufficient quantities of appropriate explosives are frequently not readily available and therefore preclude effective exploitation of obvious opportunities.

During the mid-1970s a Salvadoran official was attacked while riding in his moderately armored car.[3] The attackers stopped the official and fired at his car at point blank range with a variety of weapons. Allegedly none of the projectiles penetrated and the official was able to escape by

ramming the blockading vehicles with his car. In this instance it is apparent that either the attackers were unaware of the official's use of an armored car (unlikely) or they were ignorant of the armor penetrating potential of their chosen weapons.

The effect on other similar targets resulting from the planned intimidation, death, or destruction is the final principal consideration in target analysis. Destruction of selected electrical generating facilities can precipitate the collapse of an entire regional power grid. Deliberate contamination of a particular product can result in a fall-off of demand for the producer's other products due to a general feeling of decreased confidence. The recent incidents involving cyanide-laced Tylenol demonstrate the use of a few isolated incidents to effect a nationwide, if not international negative reaction toward a particular product line.[4] According to Johnson and Johnson, the manufacturers of Tylenol, that product's market share dropped from thirty-five percent to less than five percent almost immediately. Several months after the incident, Tylenol had recaptured only twenty-two percent of the market.

Target analysis is the collection of relevant data on each possible target. This data is then assessed in terms of each respective target's relative vulnerability to the available destructive material and the effects that could be expected from a successful operation. The product of target analysis is the objective prioritizing of the initial list of potential targets. All terrorists, guerrillas, mercenaries, and related antagonists practice some form of target analysis. Generally, the more complete the target analysis is, the more effective the attacker will be.

Once the target analysis identifies the target that will yield the greatest return for the effort expended, an operational plan is devised. The target's vulnerabilities, the possible routes of access, and the destructive material required are integrated into the step-by-step details of the plan. The principal elements of an operations plan are:

1. Selection and assignment of responsibilities to specific individuals;
2. Allocation of the equipment required for the mission;
3. Provision for communications both within the assault group and with higher headquarters;
4. Alternate plans and targets;
5. The means by which the secrecy of the operation will be preserved.

Implements of Destruction

Stones, guns, bombs, chemical and biological devices, and nuclear weapons are all implements of destruction potentially available to terrorists. Stones and other hand-thrown inert items are usually associated

with vandals and rioters. As implements of destruction they are restricted in their destructive capacity by their weight and the velocity limitation imposed by the strength of the thrower's arm. Chemical and biological devices and nuclear weapons are implements of destruction primarily in the speculative sense. The difficulties associated with procurement and employment of these devices have made their use, or even threatened use, almost unique events and therefore of little concern in the day-to-day sense. Bombs and guns are currently the principal weapons of the terrorist and will likely remain so for the foreseeable future. Therefore, the study of terrorist weaponry can and should be focused on explosive devices and small arms.

Explosive Devices

All explosive devices, regardless of origin, are similar in that each must contain a certain minimum of components. Every bomb must, of course, contain an explosive. TNT, dynamite, and various potassium chlorate mixtures are representative explosives.

Since most explosives are relatively insensitive to heat, shock, and friction, specific means must be provided to initiate the explosive charge. Blasting caps are the most available and commonly used detonators or initiators in high-explosive bombs. The initiator must be powered by an energy source such as an electrical battery, firing pin spring, or open flame.

A fusing system separates the power source from the initiator, because inserting a blasting cap into a lump of plastic explosive and then attaching each electrical lead from the blasting cap directly to a battery will result in an immediate detonation. Typical fusing systems are based on time delay, environmental sensors and physical action sensors.

Shrapnel in the form of nails, nuts and bolts, and steel balls, or a fragmentation sleeve such as a pipe, can be added if the bomb is intended for anti-personnel use. Some bombs require the close confinement of a metal pipe to ensure that the explosive charge indeed functions as an explosive.

Explosives are compounds that, when appropriately stimulated, undergo a vigorous chemical change. An explosion is the very rapid combustion of the explosive. As with other combustions, the principal products of an explosion are heat and a great deal of gas.

A rating system exists to compare an explosive's relative effectiveness, or RE.[5] Explosives are compared to TNT, which is arbitrarily assigned the value of 1.00. By this scale it can be clearly seen that C4, with its RE of 1.34, is approximately one-third more powerful that TNT per unit

volume. Certain commercial dynamites containing nitroglycerine have an RE factor of only 0.42 and are therefore about half as effective as TNT for such purposes as cutting steel or shattering concrete.

There are basically three principal sources for explosives: the military, commercial applications, and improvisation.[6] The characteristics of the explosives available from each of the three sources differ significantly.

Bulk explosives meant for military use (C4 and TNT) must be powerful, relatively insensitive to bullet impact, physically stable throughout a range of temperatures and operating environments, and generally waterproof. Commercial explosives (dynamite, water gels, and blasting agents) must meet specifications relating to toxic fumes and be inexpensive to produce, but will frequently detonate when struck by bullets and may be adversely affected by extremes of temperature and prolonged immersion in water. Improvised explosives can be readily manufactured from certain fertilizers; ammonium nitrate and sodium nitrate are two. Improvised explosives, with the exception of fertilizer-based explosives, are in general neither particularly stable nor effective, and can be somewhat hazardous to produce.

Explosives can be improvised from a number of basic ingredients.[7] Perhaps the most common is potassium chlorate, which in combination with sugar and aluminum powder is quite brisant. If a small amount of vaseline is added, this mixture assumes many of the qualities of plastic explosive, though it is by no means as stable, nor quite as powerful.

Propellants such as smokeless powder and black powder are quite explosive if tightly confined and detonated with a blasting cap. Both have been popular fillers for pipe bombs due to their ready availability and the practical impossibility of tracing the purchase point by examination of the explosive residue.

Initiators

Initiators for high explosives such as TNT or C4 are commonly called blasting caps or detonators. Blasting caps are comprised of several layers of different explosives (typically lead azide, lead styphanite, and PETN), and are produced in a variety of strengths. The standard commercial number 6 cap is sufficiently powerful to reliably detonate dynamite and specific water gel explosives, but will not reliably detonate C4 plastic explosive, which requires a blasting cap of greater strength.

Blasting caps come in two principal forms, electrical and non-electrical. Electrical caps are equipped with two solid copper wires by which the cap is attached to an electrical circuit. A standard "D" cell battery will reliably detonate most electrical blasting caps. Non-electric

caps, or fuse caps, are open on one end to accept a time or safety fuse. Time fuse has a black powder core which burns at a reasonably consistent 45–60 seconds per foot. The spit of flame emerging from the end of the fuse into the cap is sufficient to initiate the first and most sensitive layer of explosives within the cap. Both electric and non-electric caps are well suited to terrorist purposes and both have been used extensively.

Low explosives such as smokeless gun powder are initiated with blasting caps for maximum results, but can be initiated with a variety of readily available substitutes. Flash bulbs like the AG1-B will very reliably initiate black powder, smokeless powder, and potassium chlorate-based explosives.

Power Sources

As previously mentioned, all bombs need some sort of power source to activate the initiator. Typically this power source is an electrical battery. Certain batteries have novel characteristics which bear mentioning. The Kodak SX-70 series cameras have a flat, pliable battery contained in the film magazine which is powerful enough to activate as many as ten blasting caps simultaneously. This battery, with its paper construction, can be readily cut with scissors to any desired shape and still retain sufficient energy to fire a cap. The battery can thus be extremely difficult to spot even with X-ray equipment, due to its low cross-sectional density and because the bomb maker can easily alter its characteristic rectangular shape.

Radio Shack is marketing an extremely thin lithium battery with sufficient power to initiate certain blasting caps and with the ability to function even at extremely low temperatures. Such a battery could possibly remain viable after exposure to the very popular cryogenic bomb disposal technique.

Fuses

It should be borne in mind that a fuse is nothing more than a form of switch. As previously mentioned, there are three principal types of fuses: time delay, environmental, and physical action. The fuses in a vast majority of explosive devices are of the time delay variety and are no more complex than a few feet of burning time fuse, or a very simple battery and alarm clock arrangement. Other less common time delay devices use mechanical fatigue or chemical action to delay initiation.

A typical mechanical fatigue device uses a spring-type clothespin which has been modified so that the opposing jaws are electrical con-

tacts. The ends of the clothespin are squeezed together, separating the jaws and breaking the electrical circuit. A single strand of one sixteenth of an inch solder is wrapped around the compressed end of the clothespin and twisted tight, thus holding the jaws apart. The force exerted by the spring will, over a period of hours, stretch the solder sufficiently to allow the jaws to close, completing the electrical circuit and detonating the bomb.

Military M1 chemical pencils typify chemical delay devices. These self-contained pencil-sized copper tubes contain an acid vial, a cocked firing pin, and a shotgun-type explosive primer. When fitted with a non-electric blasting cap and squeezed in the appropriate place they will initiate the blasting cap in five minutes to several days, depending on the strength of the acid and the ambient temperature. Chemical pencils have been extensively used by Cuban exile groups, particularly in the southern United States.

Environmental fusing systems are those which detect some change in their physical environment. Increases or decreases in atmospheric pressure, temperature, or light can be used to initiate an explosive device. Altimeters used in aircraft, in some automobiles and by hikers can be simply modified to close or open an electrical circuit and thereby detonate an explosive device contained in an aircraft that is ascending or descending. Dial type thermometers common to photographic darkrooms can easily be modified to initiate explosive devices. This type of switch is likely to be used in conjunction with a time delay device. The thermometer is used in parallel with the time delay switch and initiates the explosive if a freezing technique is employed by bomb disposal personnel attempting to disarm the device.

Physical action fuses are the basis for most booby-trapping techniques. Many governments supply their military forces with booby-trapping devices, known as firing devices, for use with land mines. These devices rely on the unsuspecting person to either apply pressure to the fuse, release pressure by lifting some object, or pull, cut, or break a trip wire. Many of these devices have been given to, or have fallen into the hands of, potential terrorist groups. In the absence of military issued booby traps, the terrorist can easily construct his own. Spring-type clothespins can be modified to duplicate the action of almost any military firing device. Bits of food cans, paper clips, baby food jars, and balloons all lend themselves to ready conversion into physical action fuses.

The sensors used with commercial intrusion detection and environmental alarm systems are well suited for use as fuses in bomb manufacture. Microwave, passive infrared, and ultrasonic detectors are

extremely difficult to defeat if used singly; and if used in combination with one another present a virtually impossible situation for the bomb disposal technician attempting to approach a suspect item.

Fragments and Shrapnel

While some bombs, such as those intended to destroy a bridge, are designed to use only the force of the blast to accomplish their objective, many incorporate fragmentation or shrapnel elements. While both fragments and shrapnel are small pieces of metal or other hard material intended to injure exposed persons, their origins differ. Fragments are typically derived from the rupture of the container housing the explosive. In a pipe bomb the pipe contributes not only the means of confining the explosive long enough to ensure complete detonation but also acts as the source of anti-personnel fragments.

Shrapnel, on the other hand, is typically steel balls, nuts, bolts, nails or anything else added to the explosive solely for the purpose of increasing its anti-personnel effect.

For a bomb of a given size and shape, the size and uniformity of the fragments or shrapnel dictate the effectiveness of the device. A bomb producing a large number of very small fragments or shrapnel will be very lethal at ranges of less than ten meters. Beyond this distance lethality will drop off dramatically as fragment and shrapnel particle velocity drop. A modern military hand grenade with its internally segmented casing produces a large number of very small fragments.

Large fragments or shrapnel pieces add little to the effectiveness of a bomb beyond a distance of only a few feet. While it is certainly true that large chunks of flying metal are lethal at greater distances, the probability of hitting someone is generally slight. An exception to this rule is a plate charge, wherein the explosive is being used accurately to propel a metal plate at high velocity toward a specific object such as a car or an electrical power transformer.

Anti-Tank Rockets

Since World War II, most armies have been issuing some form of shoulder-fired, rocket-propelled, explosive device to combat tanks and other armored vehicles. Their use by terrorist organizations worldwide is well documented.[8] Thus far there have been only a few incidents involving their use in the United States, even though these devices are certainly available.[9] Knowledgeable analysts predict that in the forthcoming years

terrorists will make increasing use of anti-tank rockets, particularly in attacks against automobiles, buildings, and ships.[10]

Anti-tank rockets are typically two to three feet in length and two and one-half to three and one-half inches in diameter at the warhead. They have a useful range against automobiles of between 100 yards for the American L.A.W. and 350 yards for the Soviet RPG-7. The warhead typically utilizes a very powerful explosive in a lined cavity, shape charge configuration. This configuration enables the rocket to penetrate approximately twelve inches of steel armor or several feet of concrete. Despite claims to the contrary arising from the rocket attack on U.S. General Kroesen in 1981, any typical armored car hit by a properly functioning anti-tank rocket will be destroyed.[11]

A weapon of growing interest to terrorists is the German Armbrust anti-tank weapon, which utilizes a mass of plastic chips thrown from the rear of the launcher to offset the forward motion of the rifle-grenade-like projectile.[12] This allows the Armbrust to be fired in very confined spaces, for example from apartment windows and perhaps even from within automobiles.

Small Arms

Since the general characteristics and effectiveness of typical small arms are probably well understood by most individuals engaged in the study of terrorism, only a brief review will be necessary.

Handguns are classified either as revolvers or pistols. They are, with a few exceptions, intended for use within twenty-five yards, where neither great power nor accuracy are required. Most handguns are readily concealed and therefore appeal to terrorists.

Revolvers utilize a steel cylinder held within the frame of the revolver to contain the ammunition. The term revolver is derived from the rotational movement of the cylinder in aligning a fresh cartridge with the barrel. Revolvers are chambered for ammunition ranging from .22 caliber rimfires to the very potent .44 magnum cartridge. The diameter or caliber of the cartridge limits the capacity of revolvers to nine shots in .22 caliber and five or six shots with larger diameter ammunition. Revolvers are capable of using larger and more powerful cartridges than common pistols. However, most revolvers are chambered for .38 caliber or smaller cartridges, which are less powerful than the common 9mm parabellum pistol cartridge. Revolvers are not suitable for use with sound suppressors or silencers due to the escape of high velocity gas at the gap between the cylinder and barrel.

Any handgun that is not a revolver can correctly be called a pistol. The pistols of interest to terrorists function semi-automatically. When the trigger is pulled, the pistol fires one shot and reloads itself. Full automatic pistols that continue to fire and reload as long as the trigger is held back exist, but are neither common nor effective. Ammunition for semi-automatic pistols is usually contained in a rectangular steel clip or magazine that is inserted vertically into or in front of the pistol's handgrip. A semi-automatic pistol is likely to be less powerful than a revolver of the same caliber. Pistols are generally suitable for use with sound suppressors or silencers and are occasionally encountered with very effective and well-made sound-reducing devices. The noise produced by suppressed or silenced pistols varies due to a number of factors but is generally much greater than is commonly assumed. Even the best silenced pistol will still sound like a loud hand clap when fired.

Rifles and shotguns, by contrast, are intended for use at extended ranges, where greater lethality and accuracy than that associated with a handgun may be required. Rifles propel a single projectile with great accuracy and relatively high velocity over long distances. The small ammunition capacity and slow rate of fire of most hunting rifles limit their appeal to terrorists.

Shotguns propel a large number of small lead or steel balls to increase the probability of a hunter hitting a moving target. When used with larger diameter balls (shot), the shotgun becomes a very formidable weapon and is favored by police and security forces as their primary back-up weapon. Shotguns are particularly effective to about thirty-five yards, with their effectiveness rapidly diminishing beyond fifty yards. Though shotguns have been used by terrorists on many occasions, their length and limitation to an average of five shots reduce their appeal.

Machine guns are usually categorized by their size. In order of increasing size they are: submachine gun; assault rifle; automatic rifle; and light, medium, and heavy machine gun. Typically, only submachine guns and assault rifles are of interest to terrorists.

Submachine guns are differentiated from the larger weapons by their use of pistol ammunition. Weights vary with size and generally fall within a range of three and one-half to nine pounds. Submachine guns, or SMG's, almost universally use a vertically inserted magazine containing approximately thirty cartridges. When fired semi-automatically, submachine guns are effective to 100 yards or more. Except in the most experienced hands, full automatic fire is not effective against a man-sized target at more than twenty-five yards. A submachine gun has a psychological advantage over a handgun, as well as increased magazine capacity and greater accuracy at increased distances.

Shoulder-fired weapons that combine large magazine capacity, intermediate power ammunition, and a length that is typically less than thirty-six inches are termed assault rifles. Most modern armies are adopting assault rifles as standard issue in replacing the traditional infantry rifle. Relatively few terrorist groups favor these weapons, probably because their bulk precludes ready concealment.

Generally speaking, at close range the projectiles fired from most assault rifles will penetrate most armored cars. It is likely that, for this reason, assault rifles have been used in several major kidnappings in which the greater penetrating power overrode the difficulty in concealing these weapons.

Attack Techniques

When viewing the scene of a recent terrorist attack it is useful to consider why the perpetrators chose to organize their attack as they did. Determining the logic used to arrive at the planned sequence of events will assist security officials in thwarting or interdicting future attacks.

As previously stated, most actions by organized groups follow some form of plan. The plan is arrived at through the synthesis of the three primary sources of input: identification of valuable and accessible targets via target analysis, limitations imposed by personnel and logistical resources, and prior training and experience in conducting specific types of attack.

The following paragraphs will highlight decision points and various peculiarities of a variety of common attack techniques.

Automobiles

The three principal reasons to attack an automobile include the intended kidnap of a specific occupant, the assassination of one or all occupants, or more commonly, the staging of a form of media event. All require access to the target vehicle at a predetermined location.

Kidnappings can be viewed as having three distinct action phases: stopping the car, dealing with bodyguards, if present, and escaping with the victim. Halting the car can involve nothing more than planning the attack around a particular intersection with a convenient stop sign or traffic light. Or, the target vehicle could be forced to a halt by arranging for an accomplice in a vehicle in front of the target car to stop his vehicle at the predetermined moment. Additionally, barriers of some form can be erected to block the path of the target car.

Once the target automobile is halted the attackers must act quickly to identify and incapacitate any bodyguards before the shock value of the assault is overcome by the survival instincts of the intended victims. This is often accomplished by the attackers rushing toward the target vehicle, identifying the intended victim, and shooting the remaining occupants at point blank range. It is not unusual for bodyguards, if present, to be armed with nothing more potent than handguns. Shoulder weapons such as shotguns or submachine guns are generally secured in the vehicle's trunk or other non-readily accessible place.[13]

In only the rarest of instances are the bodyguards or chauffeur able to react in the few seconds available and affect the outcome of the attack. The reasons for this unreadiness vary, but they are likely to be closely related to lack of initial training, absence of regularly scheduled practice drills, and finally, an all-too-common confusion as to exact individual responsibilities.

Once the attackers have succeeded in incapacitating the bodyguards and capturing the intended victim, they must still escape, most often in the vehicles in which they arrived. The more sophisticated terrorists tend to allow greater margin for error and include additional vehicles that arrive on the scene for the purpose of transporting the remaining terrorists and their victim.

Assassinations wherein the victim is an occupant of an automobile are conducted similarly to kidnappings. The car must generally be stopped, the victim must die, and the attackers must escape. The orchestration of an assassination differs in the greater latitude afforded the terrorists as to how to stop the car. In an assassination it is not necessary for the occupants to survive the halting of the car. To be sure, some terrorists have waited for the victim's car to stop at an intersection and then opened fire in an attempt to kill the occupants before the car can speed to safety. Alternatively, some terrorists prefer to use motorcycles or other cars to pull alongside the victim's car and shoot without attempting to halt the car. Explosives, however, offer the terrorist the greatest number of options.

Explosives have been used to facilitate assassinations in a multitude of ways. Explosives have been attached directly to the victim's car and detonated by the car's motion, the passage of time, or via remote control.[14] Moderate quantities of explosives have been placed in cars which were subsequently parked along the route of the intended victim.[15] When the victim's car came directly abreast of the bomb car, the explosives were then detonated by remote control. As a variation on this idea terrorists have placed explosives beneath the road in tunnels or culverts or have attached them to bridges.[16]

Explosives can be used to project something at a car. The American Claymore mine and its foreign counterparts use one or more pounds of explosive to propel up to seven hundred steel balls toward a target. Typically this shrapnel will penetrate lightly armored vehicles at the normal employment range of ten to fifteen yards.[17] Finally, explosives have themselves been projected at automobiles in the form of the previously discussed shoulder-fired anti-tank rockets.[18]

Attacks on automobiles wherein the automobile itself is the actual target, rather than the occupants, can be classed as media events. These attacks are frequently conducted with explosives placed on or directly beneath unoccupied vehicles. Generally the targeted vehicles belong to or are parked in close proximity to a facility that is closely identified with the government or agency opposed by the terrorists.

Structures

Buildings, bridges, towers, and monuments have been subject to two principal forms of attack: the media event and deliberate sabotage. The media event can be characterized by two principal planning elements. The damage must be visual and there must be little or no risk of capture.

To accomplish these goals the terrorist usually employs explosives of some sort. The damage caused by even a small amount of explosives can, if intelligently placed, cause a great deal of highly visible wreckage.[19] Within a structure, small explosive devices are usually concealed in public access areas such as entrance ways, foyers, halls, and restrooms. The damage resulting from the explosion of these devices is usually confined to broken plaster, overturned furniture and shattered glass.

If ready access to the interior of the structure is denied to the attackers, substantial quantities of explosives can be loaded into a car or truck, which is then positioned as close as possible to the target structure.[20] Damage caused by the detonation of such a device can run into the hundreds of thousands or even millions of dollars and will be visible to all for months. Rockets are increasingly used for this sort of attack.[21] Their principal advantage lies in their being very portable and easy to employ. While damage is not usually great, it is more than sufficient for journalistic purposes.

When terrorists set out deliberately to sabotage a structure they are guided by the premise that for sabotage to be worthwhile the day-to-day functioning of the facility must be impaired. The terrorists have at their option both subtle and overt means of accomplishing this goal.

Subtle sabotage involves a series of seemingly unrelated and accidental occurrences, the sum of which results in diminished productivity. Incor-

rect lubrication of vital machinery, intentional misrouting of shipments and mis-labeling of goods are examples of subtle sabotage. Although subtle sabotage is generally slow to yield results, its effect can be considerably greater than the perpetrators' efforts would otherwise warrant. Additionally, the risk that the perpetrators may be detected is slight in comparison with the risk associated with more overt actions.

Overt sabotage typically involves utilities or facility support apparatus rather than the often better protected production machinery. Electrical power distribution networks are a case in point. It has been shown that to deny electrical power to a geographic area, it is possible to attack selectively only the easily accessible transmission line towers rather than the generating plants or relay stations. The overload caused by the loss of transmission lines has led to shutdowns of large segments of a distribution network for periods of up to several days.[22]

The mechanics of overt sabotage can involve fuel contaminants, corrosives introduced into pipes, bombs, nails embedded in coconut husks, and a plethora of other techniques. Overt sabotage can be viewed as an attempt to cause the greatest substantive damage while minimizing both the risk of detection and effort required.

Aircraft

Both corporate and commercial aircraft are tempting targets for terrorists. High value jet aircraft may be seen as symbols of wealth, political position, or national identity. The terrorist has the option, assuming accessibility, to attack unoccupied aircraft parked on the ground, aircraft taxiing to or from the runway, during takeoff or landing, and finally during the flight.

Aircraft parked in the open or hangared present a situation substantially similar to that of any other parked or garaged vehicle. All parked vehicles are susceptible to bombs, intentional mis-adjustment of vital components, and fuel contamination.

While taxiing to or from the runway, aircraft are particularly vulnerable due to their limited maneuverability. They are easily blockaded with almost any substantial object such as a car and can be readily approached and fired upon with small arms, rockets, grenades, or virtually any other form of weapon.

During takeoff and landing, aircraft can be expected to follow the approach and departure patterns established for that particular airport. This predictability allows the terrorist to position himself away from the airport and its security force, yet be certain that the aircraft of interest

will pass within range. Of particular interest to the terrorist in this situation are the shoulder-fired heat seeking missiles now in the arsenals of many nations. These are less than six feet in length, very compact, and easy to employ. They can assuredly bring down a helicopter, probably force down a typical corporate jet and severely damage a large commercial aircraft.[23] Their operating range is approximately two miles, and because they are navigated by heat seeking components they are not dependent on the operator for mid-course correction.

All manner of preplaced and smuggled bombs and incendiary devices have been used to attack aircraft in flight. If the intention of the terrorists is to destroy the aircraft at a predetermined moment then, most typically, they will employ a time delay explosive device concealed in the hold baggage. Barometric fusing has occasionally been used in lieu of a time delay mechanism.

If extortion is the goal, then a bomb is likely to be concealed in a more accessible location such as the carry-on luggage storage compartment or in the cockpit.[24]

Terrorists who hijack aircraft have used all manner of explosive devices. Hand grenades have been popular, as have small explosive charges allegedly rigged to detonate at the push of a button. These devices are typically smuggled aboard by the terrorists themselves. Hollowed out radios, books, and numerous other items afford adequate concealment from all but the most diligent security officers. Recently, terrorists threatened to ignite flammable liquids in the aisles to gain control of the aircraft. This technique requires nothing more sinister than a cigarette lighter and a plastic tube of gasoline or similar flammable liquid.

Conclusion

If the doomsayers are correct and a resurgence of terrorist violence does occur in the United States, then loud cries will be heard proclaiming the difficulty in understanding and dealing with this "new" form of violence. In truth, violence on any conceivable scale is neither new nor difficult to comprehend. Since the days of Cain and Abel men have observed their enemies, assessed their weaknesses, planned accordingly, and executed those plans within the limits of their logistical capability. To deal effectively with violence on the tactical level, it must first be understood as a logical progression of events. When the mechanics of violence are in sharp focus, then the means to thwart or avert it will become equally clear.

Table 1.—Characteristics of some Principal Explosives

Name	Principal Uses	Relative Effectiveness	Common Packaging	Texture	Color of Explosive	Other
Dynamite (all types)	road construction, agriculture, quarrying	0.42–0.92	rolled paper tubes ½ lb. and larger	granular to paste	beige to brown	may contain nitroglycerine
TNT, Trotyl	military demolition, seismic exploration, ordnance	1.0	US-¼ lb. cylinders, ½ & 1 lb. block. Eur.-200 & 400 gram blocks wrapped in brown paper	flake, pressed powder, cast	mottled green to dark brown	
Plastic Explosive C3-4, PE2-4, Semtex-H, MP-10	Military demolition	1.34	US-plastic wrapped blocks Czech-2 KG paper wrapped blocks	"putty"-smooth to slightly granular	C3-yellow C4-white PE-beige MP10-black Semtex-orange	Semtex-H has been used in virtually every letter bomb originating in Arab countries
Ammonium Nitrate	fertilizer, road construction, quarrying	very low	50–100 lb. bags	rice sized pellets	white	usually mixed with oil (6%) for use as an explosive

Notes

1. The author has constructed or observed the construction of numerous examples of both of these explosive devices. This experience has demonstrated that the actual assembly of most terrorist or sabotage devices is of an approximately equal difficulty. The acquisition of the components presents the greatest challenge to the terrorist.

2. The definition of "target analysis" and the methodology described in this chapter are a synthesis of the author's notes, recollections, and experiences.

3. Attack on Colonel Iraheta, Sub-Secretary of Defense, San Salvador, El Salvador, Feb. 9, 1979.

4. During the last week of September 1982, several Chicago area residents succumbed to poisoning after consuming cyanide-laced Tylenol.

5. U.S. Department of the Army, *Explosives and Demolitions*, FM5-25 (Washington, D.C., 1971), pp. 1-2.

6. U.S. Department of the Army, Ibid; E. I. duPont de Nemours and Co., Inc., *Blasters Handbook* (Wilmington: 1980); U.S. Department of the Army, *Unconventional Warfare Devices and Techniques*, TM31-200-1 (Washington, D.C., 1966).

7. U.S. Department of the Army, *Improvised Munitions Handbook*, TM31-201-1 (Washington, D.C., 1966).

8. The September 1981 attack on General Frederick J. Kroesen, Commander of U.S. Army forces in Europe, was carried out by Baader-Meinhof terrorists using a Soviet-made RPG-7 anti-tank rocket.

9. Robert Kupperman and Darrell Trent, *Terrorism: Threat, Reality, Response* (Stanford: Hoover Institution Press, 1979), p. 108.

10. Comments made to author by U.S. Department of State intelligence analyst.

11. These distances, dimensions, and performance figures are based on the author's observations of firing several versions of these weapons and do not necessarily correspond to other published literature.

12. The Armbrust is produced by Messerschmitt-Bolkow-Blohm GMBH.

13. It has been reported, though not substantiated, that this was the case during the kidnapping of Aldo Moro. Many, if not most, executives in the United States and elsewhere seem to prefer losing the ready accessibility of their weapons rather than having them on display.

14. Former Chilean ambassador, Orlando Letelier, was assassinated in Washington, D.C. in September 1976, when a bomb attached to his car was detonated by remote control.

15. During an attack on Venezuelan President Betancourt in 1960, the terrorists placed between twenty-five and seventy-five pounds of explosives in the trunk of a car parked along a route Betancourt was expected to use. Though the bomb was detonated by remote control at the appropriate moment, Betancourt survived.

16. On June 25, 1979, a bomb attached to the supports of a small bridge was detonated as General Alexander M. Haig, Jr., Supreme Commander of Allied forces in Europe, passed above it. The timing was slightly inaccurate and the majority of the blast vented behind General Haig's car.

17. As of March 1982, a sizable number of Vietnamese MDH series Claymore mines had been recovered by Guatemalan authorities. These weapons were being used with some effect in random attacks on automobiles transiting between Guatemala City and the western portion of the country.

18. A shoulder-fired rocket was used in the 1980 assassination of former Nicaraguan dictator Anastasio Somoza in Asuncion, Paraguay.

19. In March 1971 a powerful bomb exploded in a men's restroom in the U.S. Capitol building. Damage extended over a radius of several hundred feet and was estimated to be greater than $250,000.

20. On August 24, 1970, terrorists—utilizing approximately 1800 lbs. of ammonium nitrate fertilizer packed in a van—destroyed the University of Wisconsin's Army Math and Science Research Center. More recently, Guatemalan terrorists have parked automobiles containing 150 lb. or more of Mexican dynamite in close proximity to a number of major banks. The subsequent detonation of such bombs typically results in the shattering of glass windows but minimal structural damage.

21. The U.S. Embassy in Guatemala City was attacked by terrorists using an RPG-2 anti-tank rocket in March 1982. The explosion from the rocket's warhead penetrated the concrete wall of the embassy building and did minor interior damage.

22. Kupperman and Trent, *Terrorism, Threat, Reality, Response*, pp. 71–72.

23. The damage sustained by an aircraft hit by one of these missiles will depend somewhat upon the proximity of the disabled engine to other vital components. Helicopters, with their engine usually located immediately adjacent to the rotor shaft, are particularly vulnerable. Large four-engine airliners with their engines mounted on the pylons suspended from the aircraft's wings are much less likely to be severely damaged enough to cause a crash.

24. On March 7, 1972, a bomb detonated in the cockpit of a TWA aircraft on the ground in Las Vegas. The same day another bomb was discovered in the carry-on luggage of a TWA aircraft in New York. Both incidents were related to a demand for a multimillion dollar extortion payment.